Common Name: **IODINE**

Synonyms: Diatomic Iodine

Chemical Name: Iodine

Date: February 2010  
Revision: September 2016

### Description and Use

**Iodine** is a purple to black, crystalline (sand-like) solid with a sharp, strong odor. It is used in pharmaceuticals, dyes, photographic materials, lithography, special soaps, antiseptics, and in x-ray contrast.

### Reason for Citation

- **Iodine** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT and NIOSH.

### FIRST AID

#### Eye Contact
- Immediately flush with large amounts of water for at least 15 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while rinsing. Seek medical attention.

#### Skin Contact
- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

#### Inhalation
- Remove the person from exposure.
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.
- Medical observation is recommended for 24 to 48 hours after overexposure, as pulmonary edema may be delayed.

### EMERGENCY NUMBERS

Poison Control: 1-800-222-1222  
CHEMTREC: 1-800-424-9300  
NJDEP Hotline: 1-877-927-6337  
National Response Center: 1-800-424-8802

### Workplace Exposure Limits

**OSHA:** The legal airborne permissible exposure limit (PEL) is **0.1 ppm**, not to be exceeded at any time.

**NIOSH:** The recommended airborne exposure limit (REL) is **0.1 ppm**, which should not be exceeded at any time.

**ACGIH:** The threshold limit value (TLV) is **0.01 ppm** (as the *inhaled fraction and vapor*) averaged over an 8-hour workshift and **0.1 ppm** (as the *vapor*) as a STEL (short-term exposure limit).

- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.
Determined Your Exposure

- Read the product manufacturer’s Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, available on the RTK Program website (http://www.state.nj.us/health/workplacehealthandsafety/right-to-know/) or in your facility’s RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to iodine:

- Contact can severely irritate and burn the skin and eyes.
- Exposure can irritate the nose and throat.
- Inhaling iodine can irritate the lungs causing coughing and/or shortness of breath. Higher exposures may cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.
- Iodine can cause headache, metallic taste, nausea, vomiting, diarrhea and abdominal pain.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to iodine and can last for months or years:

Cancer Hazard
- While iodine has been tested, it is not classifiable as to its potential to cause cancer.

Reproductive Hazard
- There is limited evidence that high levels may inhibit milk production in females.
- There is limited evidence that iodine may damage the developing fetus.

Other Effects
- Exposure to high concentrations, particularly in susceptible individuals, may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- Inhaling iodine can irritate the lungs. Repeated exposure may cause bronchitis to develop with coughing, phlegm, and/or shortness of breath.
- High exposure to iodine may affect the liver and kidneys.
- Iodine may cause thyroid gland disturbances.

Medical

Medical Testing
For frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

- Liver and kidney function tests

If symptoms develop or overexposure is suspected, the following are recommended:

- Consider chest x-ray after acute overexposure
- Evaluation of thyroid function
- Evaluation by a qualified allergist can help diagnose skin allergy.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by iodine.
Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with Iodine. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Butyl, Nitrile, Neoprene and Viton for gloves, and Tychem® SL, CPF 3, CPF 4, BR, Responder® and TK, or the equivalent, as protective clothing materials.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear eye protection with side shields or goggles.
- Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over 0.01 ppm (as the inhalable fraction and vapor), use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.

- Exposure to 2 ppm is immediately dangerous to life and health. If the possibility of exposure above 2 ppm exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- Iodine is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances.
- Use water only. DO NOT USE CHEMICAL or CO₂ as extinguishing agents.
- POISONOUS GASES ARE PRODUCED IN FIRE, including Hydrogen iodide and other Iodine compounds.
- Iodine may ignite combustibles (wood, paper and oil).
**Spills and Emergencies**

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If iodine is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.
- Ventilate and wash area after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of iodine as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

**Handling and Storage**

Prior to working with iodine you should be trained on its proper handling and storage.

- Iodine reacts violently or explosively with ACETYLENE; ACETALDEHYDE; METAL AZIDES; METAL HYDRIDES; and METAL CARBIDES.
- Iodine forms explosive or shock-sensitive compounds when mixed with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) and liquid AMMONIA.
- Iodine will ignite POWDERED METALS (such as ANTIMONY, MAGNESIUM and ZINC) in the presence of WATER.
- Iodine is not compatible with COMBUSTIBLES; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); HALOGENS (such as CHLORINE, BROMINE and CHLORINE TRIFLUORIDE); and ETHANOL.
- Store in tightly closed containers in a cool, well-ventilated area.

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**Occupational Health Information Resources**

The New Jersey Department of Health and Senior Services, Occupational Health Service, offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health & Senior Services
Right to Know Program
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.nj.gov
Web address:
http://nj.gov/health/workplacehealthandsafety/right-to-know

_The Right to Know Hazardous Substance Fact Sheets are not intended to be copied and sold for commercial purposes._
GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a-lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A carcinogen is a substance that causes cancer.

The CAS number is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A combustible substance is a solid, liquid or gas that will burn.

A corrosive substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

The critical temperature is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A fetus is an unborn human or animal.

A flammable substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The flash point is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or Lower Explosive Limit, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m$^3$ means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A mutagen is a substance that causes mutations. A mutation is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A reactive substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A teratogen is a substance that causes birth defects by damaging the fetus.

UEL or Upper Explosive Limit is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually Air), at the same temperature and pressure.

The vapor pressure is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure, the higher concentration of the substance in air.
**Common Name:** IODINE

**Synonyms:** Diatomic Iodine

**CAS No:** 7553-56-2

**Molecular Formula:** \( I_2 \)

**RTK Substance No:** 1026

**Description:** Purple to black, crystalline solid with a sharp, strong odor

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### HAZARD DATA

<table>
<thead>
<tr>
<th>Hazard Rating</th>
<th>Firefighting</th>
<th>Reactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 - Health</td>
<td><strong>Iodine</strong> is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances. Use water only. DO NOT USE CHEMICAL or ( CO_2 ) as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including Hydrogen iodide and other iodine compounds. <strong>Iodine</strong> may ignite combustibles (wood, paper and oil).</td>
<td><strong>Iodine</strong> reacts violently or explosively with ACETYLENE; ACETALDEHYDE; METAL AZIDES; METAL HYDRIDES; and METAL CARBIDES. <strong>Iodine</strong> forms explosive or shock-sensitive compounds when mixed with REDUCING AGENTS (such as LITHIUM, SODIUM, ALUMINUM and their HYDRIDES) and liquid AMMONIA. <strong>Iodine</strong> will ignite POWDERED METALS (such as ANTIMONY, MANGANESE and ZINC) in the presence of WATER. <strong>Iodine</strong> is not compatible with COMBUSTIBLES; STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); HALOGENS (such as CHLORINE, BROMINE and CHLORINE TRIFLUORIDE); and ETHANOL.</td>
</tr>
<tr>
<td>0 - Fire</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 - Reactivity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DOT#:** UN 3085

**ERG Guide #:** 140

**Hazard Class:** 5.1 (Oxidizer)

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### PHYSICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor Threshold</td>
<td>Sharp, strong odor</td>
</tr>
<tr>
<td>Flash Point</td>
<td>Noncombustible</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>8.8 (air = 1)</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>0.3 mm Hg at 77°F (25°C)</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>4.93 (water = 1)</td>
</tr>
<tr>
<td>Water Solubility</td>
<td>Slightly soluble</td>
</tr>
<tr>
<td>Boiling Point</td>
<td>365°F (185°C)</td>
</tr>
<tr>
<td>Melting Point</td>
<td>236°F (113°C)</td>
</tr>
<tr>
<td>Ionization Potential</td>
<td>9.31 eV</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>253.8</td>
</tr>
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</table>

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### EXPOSURE LIMITS

<table>
<thead>
<tr>
<th>Agency</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSHA</td>
<td>0.1 ppm, Ceiling</td>
</tr>
<tr>
<td>NIOSH</td>
<td>0.1 ppm, Ceiling</td>
</tr>
<tr>
<td>ACGIH</td>
<td>0.01 ppm, 8-hr TWA; 0.1 ppm, STEL</td>
</tr>
<tr>
<td>IDLH</td>
<td>2 ppm</td>
</tr>
</tbody>
</table>

The Protective Action Criteria values are:

- \( PAC-1 = 0.1 \) ppm; \( PAC-2 = 0.5 \) ppm; \( PAC-3 = 5 \) ppm

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### PROTECTIVE EQUIPMENT

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gloves</td>
<td>Butyl, Nitrile, Neoprene and Viton (&gt;8-hr breakthrough)</td>
</tr>
<tr>
<td>Coveralls</td>
<td>Tychem® BR, Responder® and TK (8-hr breakthrough)</td>
</tr>
<tr>
<td>Respirator</td>
<td>&gt; 0.01ppm SCBA</td>
</tr>
</tbody>
</table>

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### FIRST AID AND DECONTAMINATION

- **Eyes:** Irritation and burns
- **Skin:** Irritation and burns
- **Inhalation:** Nose, throat and lung irritation with coughing and severe shortness of breath (pulmonary edema) Headache, nausea, vomiting, diarrhea and abdominal pain

**Remove** the person from exposure.

**Flush** eyes with large amounts of water for at least 15 minutes. Remove contact lenses if worn. Seek medical attention.

**Quickly** remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

**Begin** artificial respiration if breathing has stopped and CPR if necessary.

**Transfer** promptly to a medical facility.

**Medical** observation is recommended as symptoms may be delayed.

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September 2016